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BOOK REVIEW

Phylloxera, 'big science' and the nature of scientific debate

George Gale: Dying on the vine: How phylloxera transformed wine. Berkeley: University of California Press, 2011, 336pp, $39.95 HB

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This book offers a comprehensive account and analysis of the phylloxera blight that caused devastation and tremendous upheavals, both positive and negative, across the entire the world of wine from the late nineteenth century. George Gale is a philosopher with a serious knowledge of wine, and this is an impressively detailed and thorough account not merely of the viticultural effects of the bug but also of the political, social, scientific, economic and cultural consequences of its ravages. Phylloxera's rise and spread, the intense debates about its nature and cure, the various methods deployed, and the eventual reconstitution of French, and indeed world viticulture are all recounted in the form of a lively narrative that is engaging from beginning to end. Although primarily historical and documentary in its approach, the book aims to illuminate a number of broad themes along the way, including the general dynamic interaction between humans and invasive species, the formation and rise of "Big Science" and various issues in the history, philosophy and sociology of science.

Gale proposes the study of the phylloxera epidemic as an excellent model for understanding the ways in which the devastating impact of invasive species should, and should not, be dealt with. He identifies three chief factors or stages in the war against phylloxera that he takes to be symptomatic of our reactions to such threats, claiming that we should take the phylloxera case as a salutary warning when facing similar modern ills.

First, there is a stage of denial, a powerful psychological reaction of disbelief, or unwillingness to believe, that such a danger is present. Partly, in the case of the first outbreaks in France, this was due to contingent geographical factors, with different

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geological, climatic and viticultural elements all invoked by sceptical vignerons as safeguards against the bug. But, Gale seems to claim that there is a stronger, less contingent universal psychological desire behind this kind of denial. Second, there are efforts to control the threat. In the case of phylloxera, these consisted and to some extent still consist of the erection of physical and administrative barriers, quarantines and so on. For the most part, these failed to stop the bug, acting at best as delaying tactics until the third stage would be implemented, attempts to eradicate it. This consisted of a number of methods, the most successful being the use of CS2 insecticide, sand plantings and flooding. These too were only partially successful due to a number of problems, such as the need for great expertise to employ the relevant procedures; various nefarious side-effects, such as the death of vines; and the prohibitive costs involved, meaning that only large, rich landowners could afford the treatments.

Nonetheless, as Gale shows in detail, the various stages in the fight against phylloxera heralded a number of important developments and a great deal of progress in scientific understanding, technological achievement and viticultural techniques. Most importantly, Gale argues that the phylloxera battles initiated the development of "Big Science", the crucial synergy between government, industry and research institutions that increasingly play such an important role in the modern world. With great skill, he demonstrates the various intricate, complex connections that came to be forged between the local efforts of growers, researchers and agricultural societies, and national centralised funding bodies and organisations, throwing light on how steps such as the state subsidisation of local syndicates to fight the bug opened the way to successful research and eradication techniques. In particular, Gale does an excellent job of documenting how the eventual reconstitution of French viticulture by the hybridisation of American vines has improved the general productivity and quality of wine throughout the world; a silver lining marred only by recent EU directives misguidedly attempting to preserve a 'European' viticultural heritage against American invaders, a tale that Gale recounts with a nice anecdote about the travails of vignerons in the Ardèche.

A prominent theme of the book concerns the rather astonishing level of cooperation between French and American scientists at the time, and this is clearly an issue close to Gale's heart as he recounts with obvious pleasure the personal friendships—such as that between Planchon and Riley—that gave crucial impetus to the combat against phylloxera. Indeed, an interesting issues touched on in this connection is the serendipitous nature of much of the scientific progress made in the fight against phylloxera, amongst which were the lucky discoveries that flooded land and sandy soils protected against the bug. But more importantly, Gale is at pains to detail the various battles waged between the *américanistes*, who saw (rightly) the salvation of French viticulture in the use of American vines, and those who (rightly) blamed the importation of these vines for the phylloxera blight in the first place. Although Gale hints in places at entrenched cultural differences and prejudices here and offers a lengthy and detailed discussion of the debate between the use of American rootstocks with European scions vs. American-European hybrids, one of his main stated aims is to use the case of phylloxera to explore the nature of scientific debate in general.

Apart from the *amé́ricanistes* disputes, the other debate discussed at great length is that between the scientific establishment at the time (based in Paris), which wrongly held that the phylloxera insect was merely an effect of some other problem with the health of the vines, and their opponents (in Montpellier) who were right in concluding that the bug was the cause of the vines' destruction. Gale successfully shows how both sides of the dispute could interpret the very same sight—the bugs eating the vines' roots—in radically different ways due to the pervasive influence (or lack thereof) of a number of background theoretical assumptions about the nature of disease. Although agreeing in part with the views of influential sociologists of science that various social factors were also responsible for this debate, such as, for instance, the simple fact that certain influential members of the establishment were based in Paris, and their opponents in Montpellier, Gale shows, against the sociologists, that the theory based on the best evidence and arguments—the phylloxera-cause theory—ultimately triumphed over the dominant scientific paradigm of the day.

The discussion reveals the ways in which a shift away from the prevailing theory will lead to the beliefs and practices entrained by that theory being ultimately abandoned. These issues are related in the context of a concern with the complex relations between theory and practice, and Gale examines how, in the case of phylloxera, practice frequently led theory, thereby showing that the connections between theory, technological development and practice were remarkably fluid.

However, despite the impressive depth and scope of the discussion, the book suffers slightly insofar as these issues in the philosophy of science—after all one of the main stated themes of the book—are never really given much extended discussion, let alone analysis. Having been made aware of them in the introduction, the readers are left to do the majority of the work themselves in seeing how the various detailed debates examined actually bear on the nature of theory choice, disputes between sociologists and philosophers of science and the relationship between theory and practice. In short, although the book potentially offers a very nice case study for exploring these issues, it contains very little explicit philosophical discussion. For those willing to make the effort, however, or for anyone with a serious interest in the history and production of wine, this is a very rewarding study.